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[Notified in Army Orders for June, 1931.]

HANDBOOK
FOR THE
·303-IN. VICKERS MACHINE GUN
AND
TRIPOD MOUNTING, MARK IV
1930

SUPPLEMENT No. 2

**DESCRIPTION AND TESTING OF INSTRU-
MENTS USED IN CONJUNCTION WITH
THE ·303-IN. VICKERS MACHINE GUN**

LONDON :

PUBLISHED BY HIS MAJESTY'S STATIONERY OFFICE

To be purchased directly from H.M. STATIONERY OFFICE at the following addresses :

Adastral House, Kingsway, London, W.C.2 ; 120, George Street, Edinburgh ;

York Street, Manchester ; 1, St. Andrew's Crescent, Cardiff ;

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or through any Bookseller.

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By Command of the Army Council,

H. J. Creedy

THE WAR OFFICE,
30th June, 1931.

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DESCRIPTION AND TESTING OF INSTRUMENTS USED IN CONJUNCTION WITH THE .303-IN. VICKERS MACHINE GUN

1. *Foresight, bar, deflection, Mark I*

(PLATE I)

The sight is of steel and consists of:—

- i. A bar (A) about ten inches in length, graduated in intervals of ten minutes and degrees up to seven degrees right and left of the centre line.
- ii. An inverted U-shaped bracket (B) to which the bar is a fixture and which is arranged to assemble over the projecting wings of the ordinary gun foresight, where it is secured by a screw (C) in the left side of the bracket and a spring stud (D) in the right, the former engaging in the hole in the left wing and the latter in the opening in the right wing.

The upper surface of the bracket (E) is graduated in ten minute intervals, in continuation of the graduations on the bar, the centre line being indicated as zero.

- iii. The sliding sight (F) with clamp screw (G) for fixing in any desired position on (A).

The sight has a central blade and protecting wings, and is arranged to take night sights when required for night firing.

Two pointers (H) are provided on the slide to register respectively with the scale on (A) and on (B).

When assembling the sight, care must be taken that excessive pressure is not applied to the screw, as such will distort the sight protecting wings of the gun, and thereby affect the level of the bar.

2. Post, aiming, M.G., Mark I

The aiming post consists of a single telescopic stand, the top half of which can be raised or lowered.

The base of the stand is a metal plate with three spikes. The plate enables the spikes to be pushed into the ground by means of the feet, and also prevents the stand sinking too far in soft ground.

The lower half, or tube, of the aiming post has a clamping screw at the top which allows the top half to be fixed at the required extension.

The top half, or inner rod, is surmounted by a bracket, to one side of which a day aiming mark (black bullseye on a white background) is permanently fixed. The other side of the bracket provides a support for the night aiming lamp when in use. On the inner rod is a collar and clamping screw which allows this rod to be maintained at a given height when rotated.

By this means the aiming lamp can be set at the same height as the day aiming mark if desired.

3. Post, zero, M.G., Mark I

The zero post is of iron, 3 feet long and $\frac{1}{2}$ an inch in diameter. The upper end is formed as a ring 4 inches in diameter, the lower end being pointed.

4. Clinometer, Vickers .303-in. M.G., Mark I

(PLATE II)

1. *Description.*—This instrument consists of a manganese bronze casting called the "cradle" (A). The upper surface is cut to form the arc of a circle in which the arc (N) can slide, and to the lower surface is attached a cast steel base (B) adapted to rest between the side plates of the gun when the rear cover is raised.

A scale of degrees (C) from zero to 20 degrees elevation and depression is engraved on one face and is read from an arrow (D) on the arc. The graduations for elevation and depression are filled in with black and are numbered every 5 degrees and followed by the letters "E" and "D" respectively.

A worm spindle is fitted in two bearings in the cradle, one end (E) being on a pivot. This allows the worm to be put out of gear with the arc, for quick setting, by pressing downwards on the other end (F) of the worm spindle.

A spring is provided to keep the worm spindle and arc in gear.

Two micrometer collars are fixed to the worm spindle, one (G) for reading depression in minutes, the other (H) for reading elevation in minutes.

The micrometer collars are divided every five minutes and numbered every ten minutes, and are coloured the same as the degree scale. The figures on the micrometer collars have the letters "E" and "D" engraved underneath to indicate elevation and depression respectively.

At one end of the worm spindle a milled head (J) is

firmly attached; one turn of this milled head represents one degree.

The arc (N) is shaped to slide in the cradle. On its under surface are teeth into which the worm gears. Attached to it by two screws is an adjustable reader (K) for the degree scale. On its upper surface is attached a spirit-level (L).

Engraved on the base is an arrow (M) and the word "Target." This is to indicate the correct direction in which to place the clinometer on the gun.

2. To test the clinometer.

- i. Set the scale to zero.
- ii. Place the clinometer on the gun, elevate or depress until the bubble is in the centre of its run.
- iii. Reverse clinometer and note position of the bubble.

(a) If *central*, the clinometer is in adjustment, but confirm at, say, ten degrees depression and ten degrees elevation.

(b) If *displaced*, this indicates that an error is present.

- iv. In the case of (b) leave the clinometer on the gun and rotate the minute scale until the bubble is again central, then note the scale reading.

- v. Having noted the variation from zero, halve it and set the scale to this point, *e.g.* suppose that reader points to twenty minutes E, remove clinometer and set scale to ten minutes E.

- vi. Replace on the gun and proceed as in (ii) and (iii); if the bubble does not come central, repeat the process.

Notes.—1. When rotating the minute drum always turn to the *left* last, *i.e.* anti-clockwise. Should an error be found, it will be seen that when the clinometer is truly horizontal there will be a variation in the zero reading. This error will be noted and the instrument adjusted as soon as possible.

3. If a gun is levelled with a clinometer known to be correct, then any number of clinometers can be tested by placing them on the gun in the ordinary way and noting if there is any error.

4. *To adjust the clinometer.*—Set the clinometer at the error noted. With a spanner loosen the "nuts securing micrometer collar," set the scale to zero and tighten up.

If the variation is large, it may be necessary to reset the degree reader. This is done by loosening the two securing screws and sliding the reader to right or left, as may be necessary, and then clamping up.

Note.—Adjustments will be carried out only by armourers.

5. Director, No. 4, Mark II

(PLATE III)

1. *Description.*—This instrument consists of:—

- i. The telescope (which is of the prismatic type and is contained in a rectangular aluminium box (A)).

Magnification	6 diameters
Field of view	8° 24'

Effective aperture of object
glass 1.2 inches

A vertical pointer is mounted in the focal plane of the object glass.

- ii. The *clinometer level* consists of a bubble arm (B), pivoted to the front end of the telescope body and having a worm arc cut on its rear end. A reader for the degree scale (C) is engraved on its rear end. A bubble spirit glass is mounted on this arm. It can be adjusted by turning a large capstan-headed screw which passes through the front end of the bubble casing.

A worm spindle, having micrometer heads (E) (elevation) and (D) (depression) graduated in divisions of five minutes, gears with the arc on the bubble arm. It is kept up to its work by a flat nickel alloy spring (F); the micrometers are not adjustable.

A degree scale (C) graduated from ten degrees elevation to ten degrees depression is attached to the telescope body. The graduations of elevation scales are filled with black and those for depression with red.

Two projecting pieces (G) and (H) protect the bubble from damage.

- iii. The *slider* (J) is attached beneath the telescope. It is shaped to fit into the "Stand, No. 4 director." A flat nickel alloy spring beneath it takes up all up-and-down play between the director and the stand.

The weight of the instrument is two pounds. The stand consists of:—

- iv. A *tripod* (A), having mahogany legs with steel shoes. The legs are hinged to a base plate (B), around the upper end of which the clamping socket (C) can revolve. An anchoring hook (B 1), to which a steadying weight can be attached, is screwed into the base plate.

The lower end of the *clamping socket* is roughened, so that a good grip of the fingers can be obtained when it is being revolved. The clamping screw (D), when tightened up, clamps the clamping socket to the base plate (B).

To the top of the clamping socket is attached, by screws, the *degree scale plate* (E). The rim of this plate, which is made of nickel alloy, is graduated in both directions from 0 to 180. "Right" and "Left" are indicated by "R" and "L" beneath each number.

Pivoted to the degree scale plate (E) is the *index plate* (F). A small piece of nickel alloy, upon which an arrow for reading the degree scale is engraved, is let into the plate.

Upon the index plate are mounted a "*bubble, spirit, cased, No. 1*" (G), and a *magnetic compass* (H). The needle of the compass can be raised from, or lowered on to, its pivot by means of a slide, which is not shown in the plates. The index blocks of

the compass can be adjusted by turning two small screws.

The *clamping nut* (J) clamps the degree scale plate to the index plate by means of an internal clamping ring.

Attached to the upper surface of the index plate is the *carrier bracket* (K), to which is pivoted the *carrier* (L). The carrier is shaped to take the base of the No. 4 director. A stop (M) prevents the insertion of the director from the wrong end, and a side spring (N) of nickel alloy takes up side play.

A *slow motion elevating gear* (O), consisting of a nut and right and left-handed screws, which are attached to the index plate and carrier, allows the director to be moved smoothly between 25° elevation and 18° depression.

The weight of the stand is eight pounds.

2. To test the director for angle of sight.—This is done as follows:—

- i. Select a position where there are two walls or upright posts, about 200 yards apart, and as far as possible in the same horizontal plane. (See Diagram, Plate V.)
- ii. Take the instrument to one wall (A), if possible at the corner of a house. If testing a No. 4, Mark II, director, set the degree and minute scales to zero. (This should not be necessary with a later pattern director.) Now lay the instrument on the other wall, and by means of the elevating gear centralize the bubble.

Look through the telescope and direct some one to mark the point aimed at on a distant wall (B). Mark the wall where you are standing at (A) at the same height as the object glass of the instrument.

- iii. Take the instrument to the distant wall (B), and place the object glass against a mark (B) made on the wall. In the case of the No. 4, Mark II, director, keep the degree scale to zero. Bring the bubble to the centre of its run by means of the elevating gear.

If the instrument is now found to be laid on the mark (A), it is in adjustment.

- iv. If it is desired to test more than one instrument it is necessary to obtain a horizontal line.

If, as in sub-para (iii), above, the instrument is found to be laid on the mark (A), the line joining (B) and (A) is a horizontal line, and it may be used to test other instruments.

If the instrument is found not to be laid on (A), the bubble being central, direct some one to mark the spot on which it is laid (C).

Now make a third mark (D) on the first wall, exactly halfway between (A) and (C). This mark (D) in conjunction with the mark (B) will form a horizontal line.

To prove accuracy it is advisable to place the instrument at (D) and check back on (B).

When the horizontal line has been obtained the other instruments can be checked and adjusted on it.

- v. Having laid out a horizontal line, proceed to test the instrument.

In the case of the No. 4, Mark II, director, set the degree and minute scales to zero. (This is not necessary with later patterns.)

Place the object glass at one end of the horizontal line and lay on the point with the elevating gear at the other end of the line laid out. The bubble should then be central; if it is not, turn the micrometer head until it is so and note the error.

In the case of directors of later pattern than the No. 4, Mark II, it is only necessary to lay on the opposite mark and note that the bubble is central. If the bubble is not central, elevate or depress the telescope until it is so and note the error through the eyepiece.

Note.—Where adjustment is necessary, it will be carried out by an armourer.

6. Sights, night, Vickers 303-in. M.G.

(PLATE I)

i. The *foresight* consists of a vertical, rectangular, sheet steel plate, $1\frac{7}{8} \times 2\frac{3}{8}$ inches, shaped and pierced to form sighting features, and mounted upon a steel body with spring arms, by means of which it is attached to the protecting wings of the sliding sight of the deflection bar foresight. It can also be attached to the foresight bracket of the gun if required.

The sighting features consist of a barley-corn, formed centrally on the upper edge; below this is an aperture; then a rectangular opening having an inverted barley-corn projecting from its upper edge, and a combined

aperture and blade from its lower edge, whilst a notch is cut in each side to indicate normal limits of traverse, the spacing being equal to about one degree of angle in each direction.

The foresight is assembled to the sliding sight of the deflection bar foresight by being sprung on to the protecting wings from the side which faces the breech of the gun.

ii. The *backsight* consists of a vertical rectangular steel plate about $1\frac{3}{8} \times 1\frac{5}{8}$ inches, pierced to form a sighting aperture about $\frac{3}{8}$ inches in diameter, and below, to the right and left of the aperture, two small rectangular openings behind which a background of luminous paint can be employed if required as a guide to the position of the aperture.

The plate is secured to a small steel body, to which is attached a spring clip for engagement with the tangent sight slide of the gun.

The backsight is assembled to the slide by pressing it on to the projecting blade portion from the left, care being taken to see that the horizontal ledge of the body rests on the upper edge of the blade, and that the bent lip on the right side of the spring engages over the inner edge of the slide.

7. Rule, slide, M.G., Mark I

The following scales, etc., are engraved on the slide rule:—

- (a) Safety angle scale.
- (b) Degree scale—graticule card.
- (c) V.I. and H.E. scale.
- (d) Wind scale.

- (e) Barometer and temperature scales.
- (f) 1 in 20,000 scale, showing yards.
- (g) 1 inch to 1 mile scale, showing yards.
- (h) Degree scale similar to that on the service protractor.
- (i) Range Tables.

(a) *Safety angle scale.*

Engraved on the rule is a Range to Target scale marked in hundreds of yards from 600 to 2,800, and opposite to this on the slide is a Range to Troops scale marked in black from 600 to 2,000 yards and in red from 500 to 100 yards.

The safety angle scale is used in accordance with the instructions laid down in S.A.T., Vol. III, for which purpose a cord 24 inches in length is attached to the top of the slide rule.

Care must be taken that this cord does not become knotted and is exactly the correct length.

(b) *Degree scale—graticule card.*

The slide is marked with a degree scale opposite the top of the slide, and an arrow on the slide which can be used for graticule purposes in conjunction with the cord attached to the slide rule.

(c) *V.I. and H.E. scale.*

A V.I. scale marked in hundreds of yards from 300 to 10. In conjunction with this is an H.E. scale marked in hundreds of yards from 3,000 to 100, and a degree scale marked from 0° to 10° .

An arrow marked on the slide enables angles to be read off in conjunction with the V.I. and H.E. scales.

(d) *Wind scale.*

On the reverse side of the slide are marked allowances for a 20 m.p.h. wind. The allowance for a side wind is shown on one side and marked from 115 minutes to 10 minutes, and on the other side is the allowance for head or rear winds marked from 90 minutes to 5 minutes.

A wind pointer is provided in the centre of the top cut-away portion on the back of the rule.

(e) *Barometer and temperature scales.*

On the reverse side of the slide is also marked the allowance for 1 inch of barometer from 5 minutes to 25 minutes.

Allowance for 20° of temperature is also marked from 5 minutes to 35 minutes.

A pointer is provided in the centre of the bottom cut-away portion on the back of the rule.

(f) *1/20,000 scale.*

This scale is shown in divisions of 50 yards, and larger divisions mark the hundred, five hundred and thousand yards. The thousand marks are numbered in full.

(g) *1-in. to 1 mile scale.*

This scale is marked in divisions of one hundred yards each and the larger divisions are one thousand yards.

(h) *Degree scale—protractor.*

In the centre of the sloping side is a protractor degree scale marked from 0° to 90° and used in conjunction with the 0 on the other sloping side of the rule.

(i) *Range Tables.*

On the back of the slide are marked the following extracts from the Range Tables :—

- Tangent angles.
- Angles of descent.
- Length of beaten zones and cones.
- Position of lowest shot below centre of cone.

8. *Plotter, field, Mark IV*

The field plotter consists of a base, two range arms and two protractors. The base consists of two slides held together. On the inner side of each slide is a scale of yards from 0 to 3,500. At the right-hand end of each slide is an arrow for use in connection with the scale on the other slide.

When the slides are closed together no scale is visible, and when pulled out to their fullest extent both scales are fully visible. The slides can be clamped in any desired position.

On the right hand end of each slide is a semicircular protractor graduated from 0 to 180 in degrees and numbered every five degrees.

Attached to the centre of each protractor is a range arm which can be rotated round it. On each range arm is a pointer for use in connection with the protractor.

The range arms are held together by a double clamp and are graduated in yards from 2,100 to 6,500 on their outer sides. On the double clamp is an arrow, one on each side, for use with these scales.

9. *Lamps, aiming, M.G., Mark II*

1. *Description.*—The lamps are contained in a

wooden box, there being two lamps in each box. On the side of the box is a folding handle.

In the lid of the box is a drum on which is wound a separate cable for each lamp. This drum is operated by the folding handle.

In the box is the battery and a spare battery, held in place by an ebonite strip and a screw. On the side of the compartment for the batteries is an adjustable resistance for regulating the amount of light shown by the lamps.

Next to the batteries is the switch. Either lamp can be illuminated by moving the switch to one of the points marked 1 and 2 on either side of the "Off" position.

Both can be put on together by moving the switch to the point opposite the "Off," also marked 1, so that the switch covers that point and also that marked 2.

Next to the switch is a block of wood with two holes to take spare bulbs. A hole is cut in the side of the box so that the lid can be closed when the cable is out and the lamps ready for use. Two spare batteries for the lamps are carried in addition to those in the box.

2. *Instructions for the care and use of Lamps, aiming, M.G.—*

i. Before the box is opened, the folding handle of the drum is to be opened out ready for use. This is important, as if the handle is left folded the cable is liable to be pulled away from the connecting screws of the terminal plates of the lamp.

ii. When the lamp is not in use, care should be taken to ensure that the switch is left at "Off" and quite clear of "1" and "2."

iii. No projecting strands of wire should be allowed to touch any terminal other than that to which they are

attached. Particular care should be taken to prevent any exposed wire from touching the terminals of the spare cell.

iv. The folding handle of the drums should be restored into its slot when the box is closed for travelling.

v. When the cable is being unwound, both wires should be unwound together. Speed should not be attempted. The lamps should not be held in the hand, but by the wire about a foot from the lamp. Neglect of this precaution may result in the lamp being jerked and the connection carried away should the cable jam on the roller.

During unwinding, the man at the box should take care that no loose coil of cable is allowed to loop round the ends of the roller.

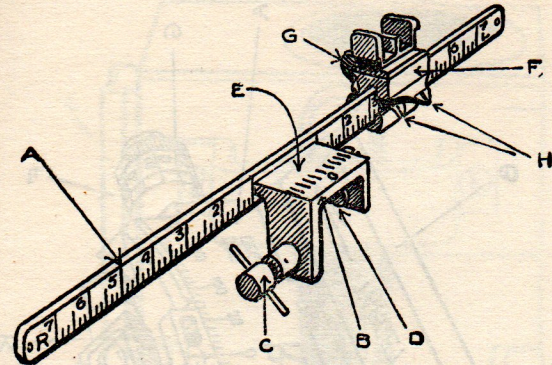
vi. When the cable is being wound in, the following procedure is the simplest. The man should hold the body of the box between his knees, turn the handle with his right hand and with his left hand lead the two cables, held as a double cable, regularly across the drum. Regularity in winding-in is essential to ensure that the cable can be instantly unwound when required.

vii. The coil of the adjustable resistance should be kept free from knocks and kept in its seating.

viii. When in the box, the lamps are placed back to back on two iron pegs. The word "Top" on the lamps indicates the position when on the target post, not when in the box.

ix. When the cells are being placed in position it may be necessary to cut the cardboard edge in order to give the ebonite securing strip a good seating on top of the cells.

FORE-SIGHT, BAR, DEFLECTION, Mk. I.



SIGHTS, NIGHT.

FORE.

BACK.

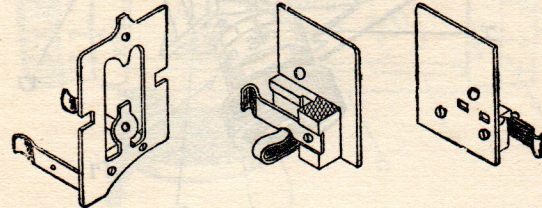


PLATE I.

CLINOMETER, VICKERS 303-IN. M.G., Mk. I.

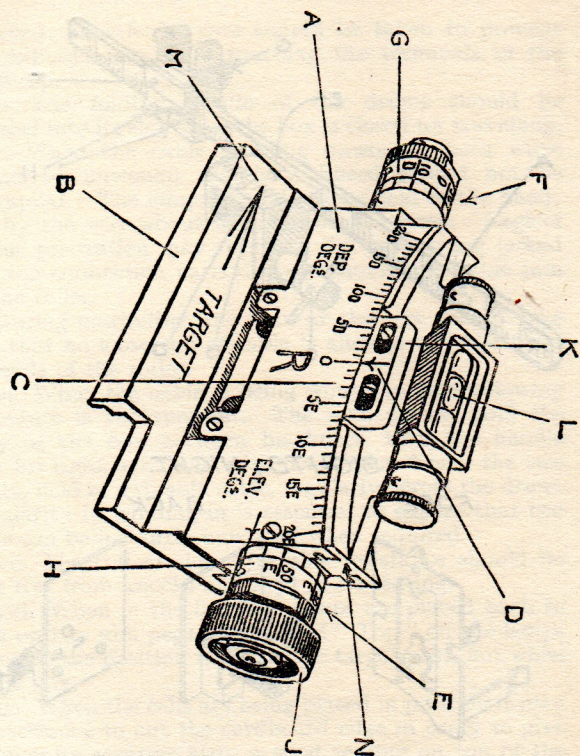


PLATE II.

DIRECTOR, No. 4, Mk. II.

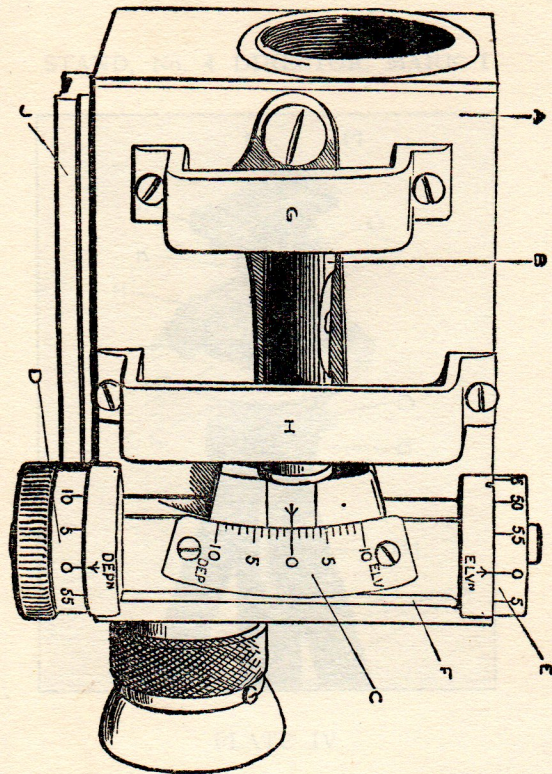


PLATE III.

STAND, No. 4 DIRECTOR, MARK I

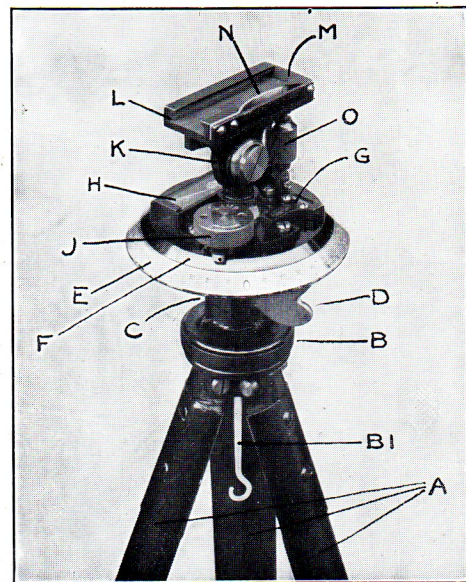
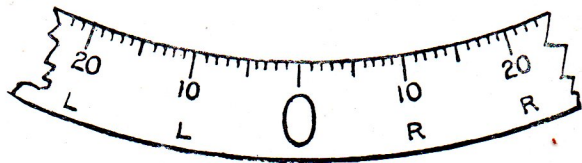


PLATE IV

STAND, No. 4 DIRECTOR, MARK I

Segment of degree scale plate



DIAGRAM

(referred to on page 12)

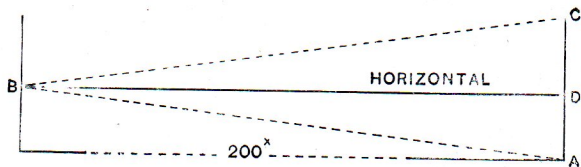


PLATE V





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